GATES LEARJET CORPORATION

maintenance manual

CHAPTER

79

OIL

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GENERAL - DESCRIPTION AND OPERATION

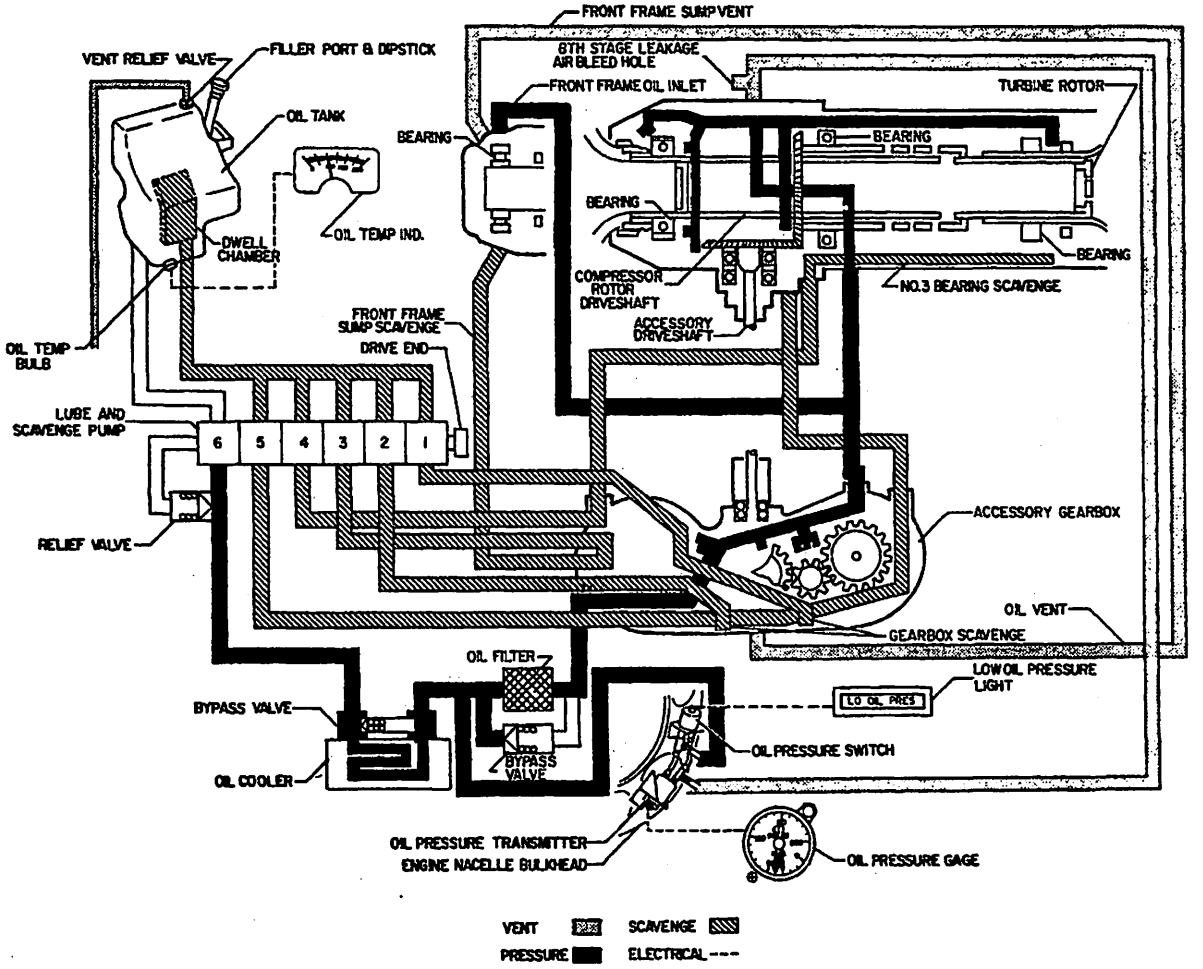
1. General
 A. The engine has a pressurized closed-circuit lubrication system designed to lubricate the compressor rotor and turbine rotor shaft bearings, accessory drive shaft assembly, and accessory drive gears.

2. Description
 A. The engine lubricating system consists of an oil tank, lube and scavenge pump, oil cooler, oil filter, oil pressure transmitter, oil pressure switch, and bypass and pressure relief valves. The stainless steel oil tank is attached to the lube pump on the right side of the engine and has a capacity of 4 quarts. The system is serviced by a fill port located at the upper aft side of the tank. Attached to the cap of the fill port is a dipstick graduated in pints of oil to be added. An aluminum tube is attached to the pressure vent relief valve located on top of the tank and is routed to the gang drain at the lower centerline of the engine. A dwell chamber in the tank is used to separate the air from the oil. An oil temperature bulb is mounted in the lower side of the tank and provides an electrical signal to the oil temperature gage on the instrument panel. The lube and scavenge pump is a positive displacement six-element pump, one element for pressure and five for scavenge. The pump is mounted on the aft side of the accessory gearbox. A relief valve is installed on the pressure side to prevent system overpressure. The oil cooler is a liquid-to-liquid heat exchanger mounted on the oil tank. It consists of numerous passages where both fuel and oil pass simultaneously through adjoining passages and exchange of heat occurs between hot engine oil and cool fuel. A bypass valve is contained within the assembly to allow bypassing of oil if the cooler becomes clogged. The oil filter assembly is attached to the lube pump housing. The screen filters out oil contaminants and is removable for cleaning. A filter bypass valve is included in the core of the filter element. If the filter element becomes clogged, the bypass valve opens to permit a direct flow of oil through the unit with filtration. The oil pressure transmitter and oil pressure switches are mounted on the nacelle bulkhead and are connected to an oil pressure hose and an oil vent hose. The oil pressure transmitter provides an electrical signal to the oil pressure gage on the instrument panel. The oil pressure switch provides a completed circuit to the low oil pressure light on the readout panel when the oil pressure drops to approximately 6 psi.

3. Operation
 A. The pressure element of the lube pump draws oil directly from the tank and pumps it through the oil cooler and oil filter into the accessory gearbox. Some of the oil lubricates the accessory gearbox bearings and spur and bevel gears. The remainder flows through the

gearbox to two outlet ports in the gearbox. Oil from one of the outlet ports in the gearbox is carried by tubing to the front sump where it is directed by an internal line to provide positive lubrication and cooling for the front frame roller bearing. The oil is recirculated to the oil tank from the sump through the bottom of the front frame strut and into the accessory gearbox and through the scavenge element of the lube pump. From the other outlet port, oil is directed to the remaining compressor rotor and turbine rotor shaft bearings and bevel gears of the accessory drive shaft. Oil is scavenged from the compressor rotor drive shaft housing and accessory gearbox and returned to the tank through the scavenge elements of the lube pump.

B. The engine lubrication sump vent system is designed to maintain a controlled positive pressure in the front bearing sump, compressor rotor shaft sump, accessory gearbox, and oil tank. The purpose of maintaining a positive pressure is to make the lubrication system insensitive to altitude. Controlled engine compressor air leakage thru the carbon seals pressurizes the sump. The scavenge pumps extract an air-oil mixture from the sumps which is returned to the oil tank. Excessive pressure buildup in the tank is vented overboard through a vent relief valve set at 2 to 3 psi. The vent valve has a small orifice through its center which depressurizes the system at engine shutdown.

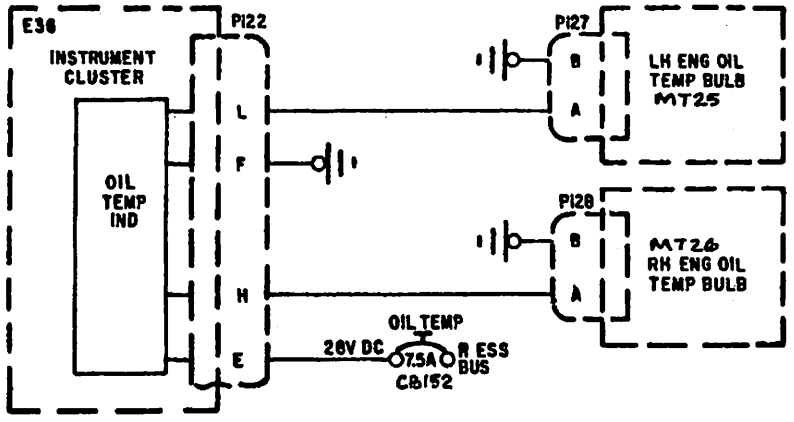


Engine Lubrication System Schematic
Figure 1

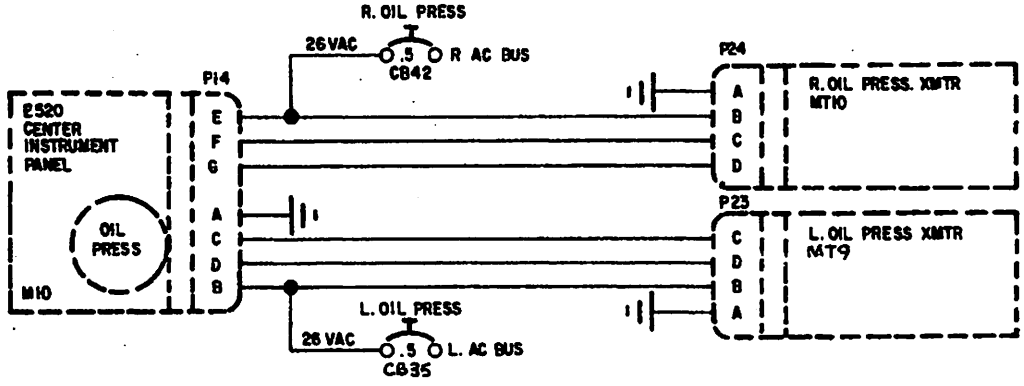
OIL INDICATING - DESCRIPTION AND OPERATION

1. General
 A. Oil pressure and oil temperature indicating systems are installed to provide the crew with visual indication of engine oil pressure and temperature at all times.

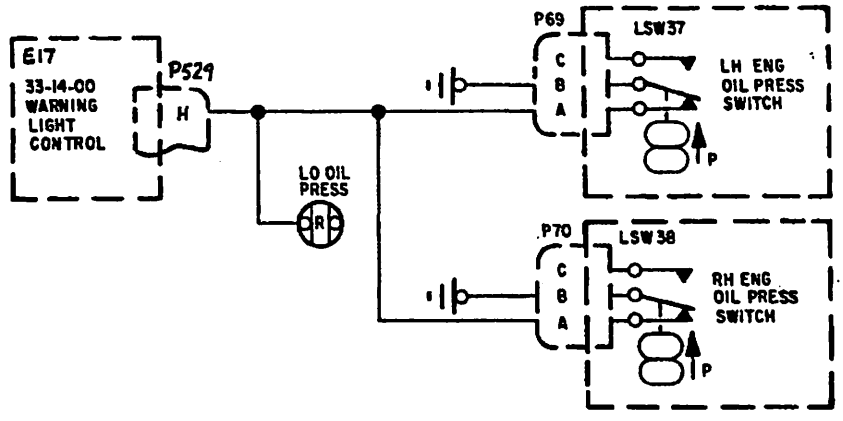
2. Description
 A. The oil pressure indicating system consists of an oil pressure switch and an oil pressure transmitter located on the nacelle bulkhead and a dual reading indicator on the instrument panel. The system is powered by 26 vac, 400 Hz through the R OIL PRESS and L OIL PRESS circuit breakers.
 B. The low oil pressure warning system utilizes the oil pressure switches and a LO OIL PRESS (Red) warning light located on the glareshield. The oil pressure switch completes a ground circuit, to light the warning light when engine oil pressure drops below 6 psi in either engine.
 C. The engine oil temperature indicating system consists of a resistance-type temperature bulb in each oil tank and two oil temperature indicators on the instrument panel. The system is powered by 28 vdc through the OIL TEMP circuit breaker.



OIL TEMPERATURE INDICATING SYSTEM



OIL PRESSURE INDICATING SYSTEM



LOW OIL PRESSURE WARNING SYSTEM

Oil Temperature, Pressure and Warning Electrical Control Schematic
Figure 1

OIL INDICATING - TROUBLE SHOOTING

1. General

A. The following trouble shooting procedures are for the airframe portion of the oil pressure and oil temperature indicating systems. For trouble shooting the engine oil system refer to manufacturer's maintenance manual.

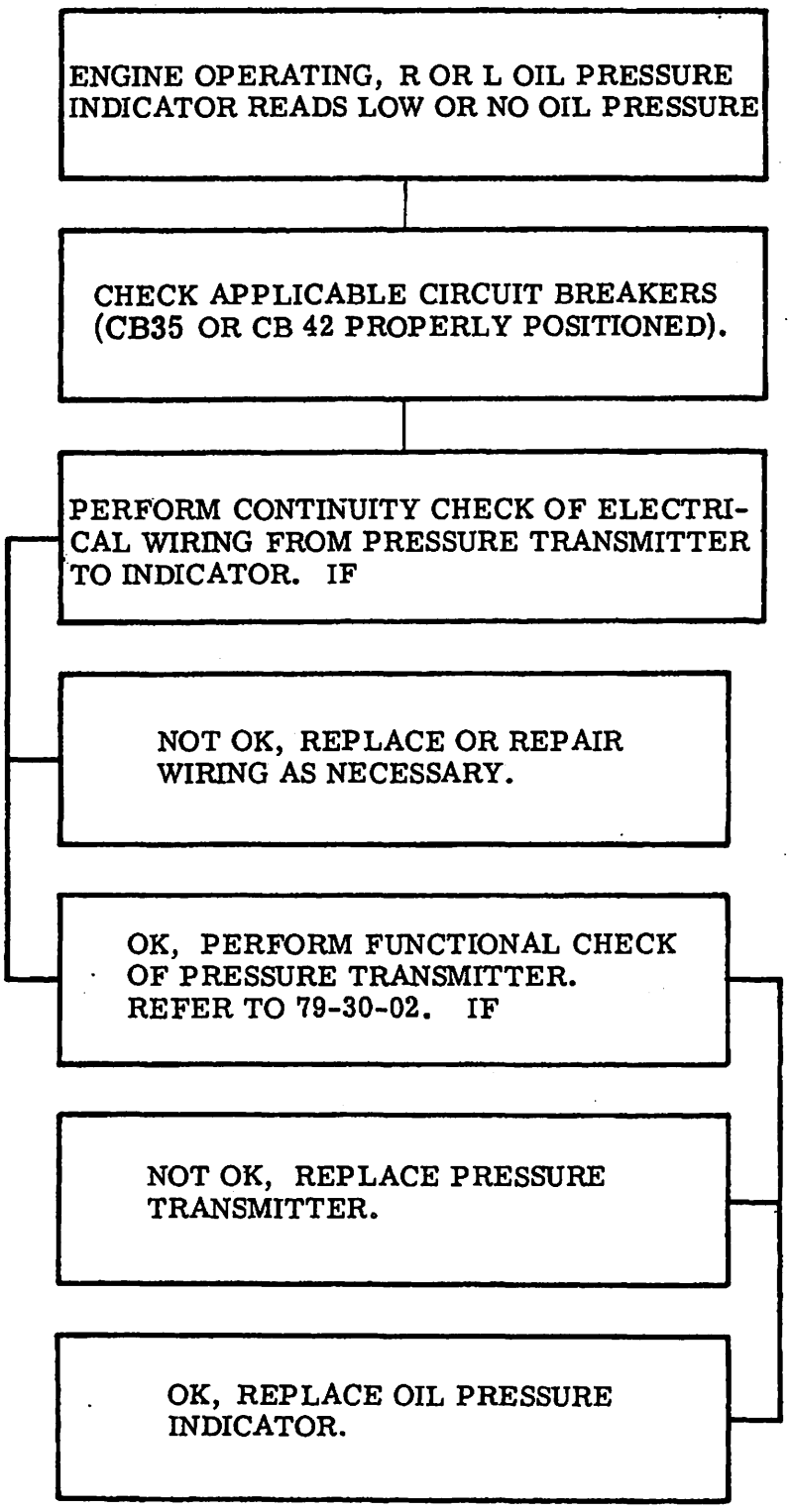
2. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items.

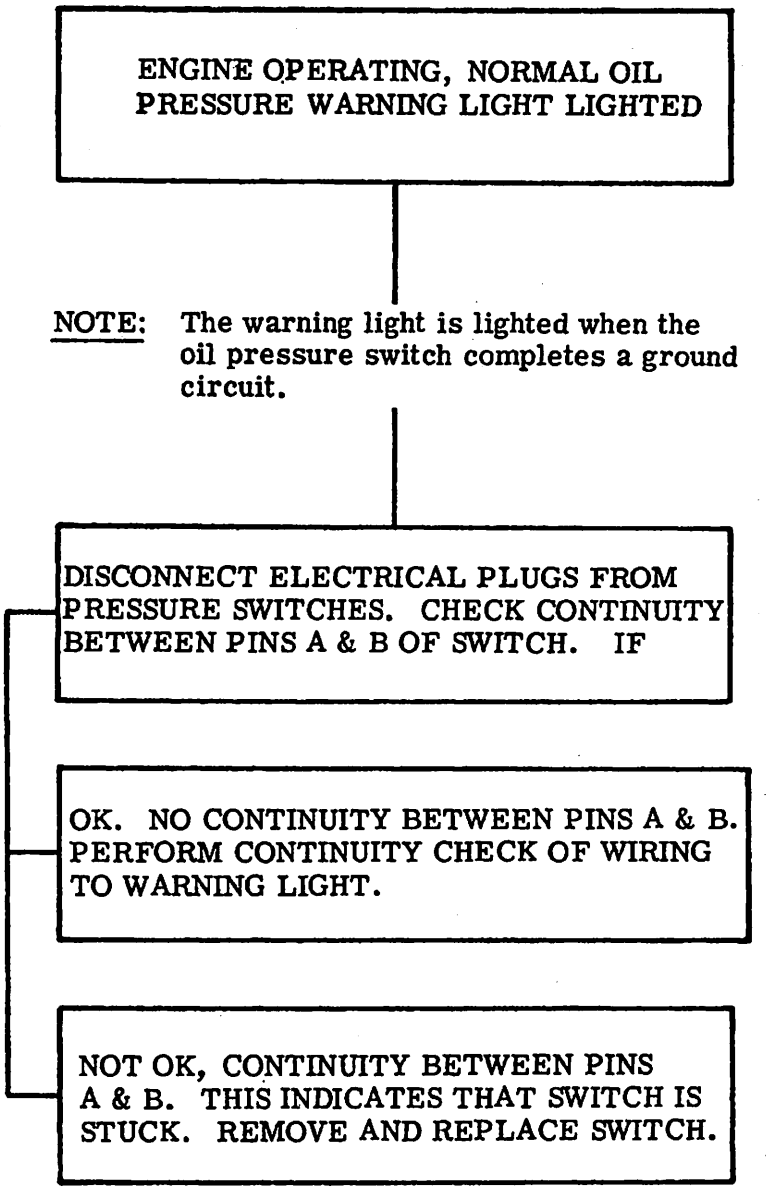
NAME	NUMBER	MANUFACTURER	USE
Voltmeter	3430A	Hewlett Packard	For checking circuitry.
or			
Voltmeter	260	Simpson	For checking circuitry.

3. Trouble Shooting

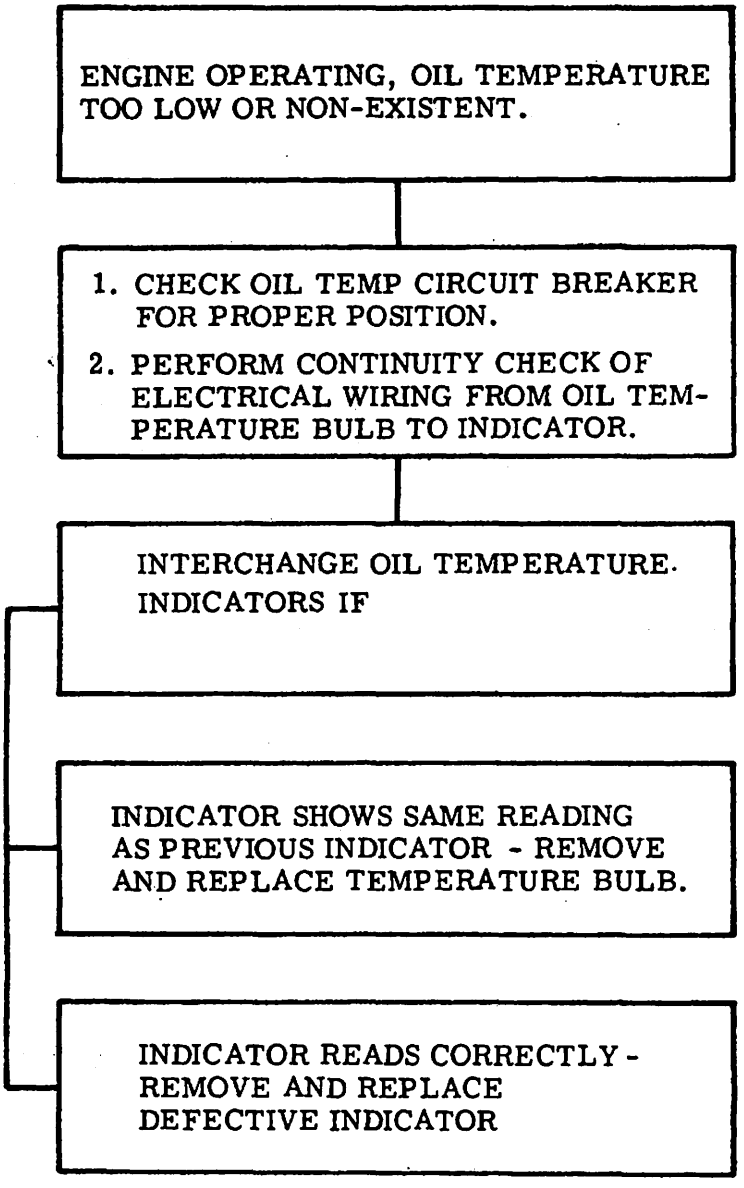
A. See figure 101 for oil pressure transmitter system trouble shooting procedure.
B. See figure 102 for oil pressure warning system trouble shooting procedure.
C. See figure 103 for oil temperature system trouble shooting procedure.



Oil Pressure Transmitter System Trouble Shooting
Figure 101



Oil Pressure Warning System Trouble Shooting
Figure 102



Oil Temperature System Trouble Shooting
Figure 103

OIL PRESSURE INDICATOR - MAINTENANCE PRACTICES

1. General
 A. The oil pressure indicator is located on the center instrument panel. The indicator has dual pointers marked L and R with inputs from the separate left and right oil pressure transmitters.
 B. Maintenance practices consist of electrical wiring checks to and from the indicator and replacement of defective indicator.

2. Removal/Installation
 A. Remove Oil Pressure Indicator
 (1) Remove avionics control heads from RH side of engine instrument panel.
 (2) Disconnect electrical plug from oil pressure indicator.
 (3) Loosen and remove screws securing instrument clamp to panel.
 (4) Remove oil pressure indicator from panel.
 (5) Remove instrument clamp from indicator.
 B. Install Oil Pressure Indicator
 (1) Install instrument clamp on indicator.
 (2) Install indicator and secure to engine instrument panel.
 (3) Connect electrical plug to indicator.
 (4) Install avionics control heads.

OIL PRESSURE TRANSMITTER - MAINTENANCE PRACTICES

1. General

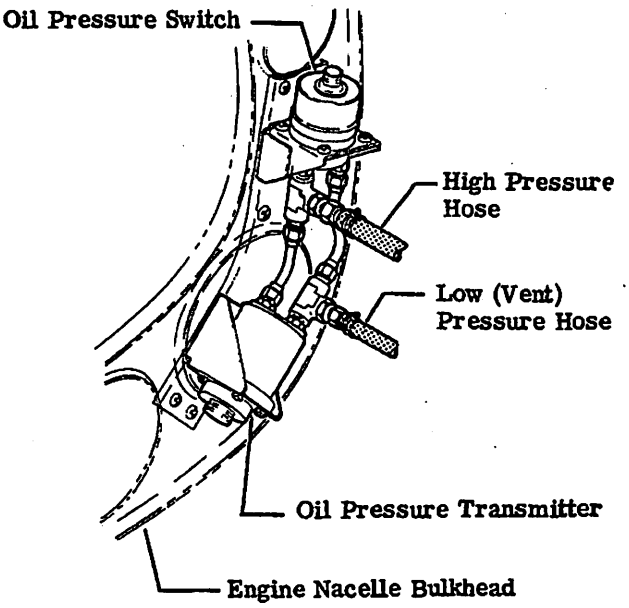
A. An oil pressure transmitter is installed on each engine nacelle bulkhead and senses oil pressure between the fuel-oil cooler and the gear reduction box. Access to the oil pressure transmitter is gained by removing the upper and lower nacelle covers. Refer to Chapter 71.

2. Removal/Installation

NOTE: Removal and installation procedures for the LH and RH transmitters are typical.

A. Remove Oil Pressure Transmitter (See figure 201)
 (1) Remove lower engine nacelle cover. (Refer to 71-10-00)
 (2) Disconnect electrical plug from pressure transmitter.
 (3) Disconnect tubing from transmitter. Cap tubes.
 (4) Remove attaching parts and transmitter from brackets.

B. Install Oil Pressure Transmitter (See figure 201)
 (1) Install pressure transmitter and secure with attaching parts.
 (2) Remove cap from tubing and connect tubing to transmitter.
 (3) Connect electrical plug to transmitter.
 (4) Install lower engine nacelle cover. (Refer to 71-10-00)



Engine Oil Pressure Transmitter Installation
Figure 201

3. Adjustment/Test

A. Functional Test of Pressure Transmitter (See figure 202.)

NOTE: • The following functional test procedure is performed with the pressure transmitter installed on the engine.

• The following functional test shall be performed to check the integrity of an oil pressure transmitter.

(1) Disconnect oil pressure line from transmitter. Cap exposed oil pressure line.
(2) Connect test equipment.
(3) Set Battery and Inverter Switches to ON.
(4) Assure that R OIL PRESS and L OIL PRESS circuit breakers are depressed.
(5) Adjust pressure regulator to bring pressure gage reading up to but not exceeding 40 psi. Lightly tap transmitter.
(6) The oil pressure indicator on the instrument panel shall read 40 (±3) psi.
(7) Repeat step (5), adjusting pressure regulator to 70 psi and lightly tapping transmitter.
(8) The oil pressure indicator on the instrument panel shall read 70 (±4) psi.

NOTE: If the indicator fails to respond to the pressure inputs, the transmitter shall be replaced. A transmitter known to be good may be substituted and the functional test re-run.

(9) Reverse the procedure by adjusting pressure regulator to 40 psi.
(10) The oil pressure indicator shall read 40 (±3) psi.
(11) Set Battery and Inverter Switches to OFF.
(12) Disconnect test equipment and connect oil pressure line.

B. Oil Pressure Transmitter Test and Adjustment

NOTE: • The adjustment eccentric is located beneath the nut which is located adjacent to the vent (V) and pressure (P) ports on the transmitter.

• If an oil pressure transmitter or indicator is replaced, the following test and adjustment procedures can be used to zero the indicator and the transmitter, if necessary.

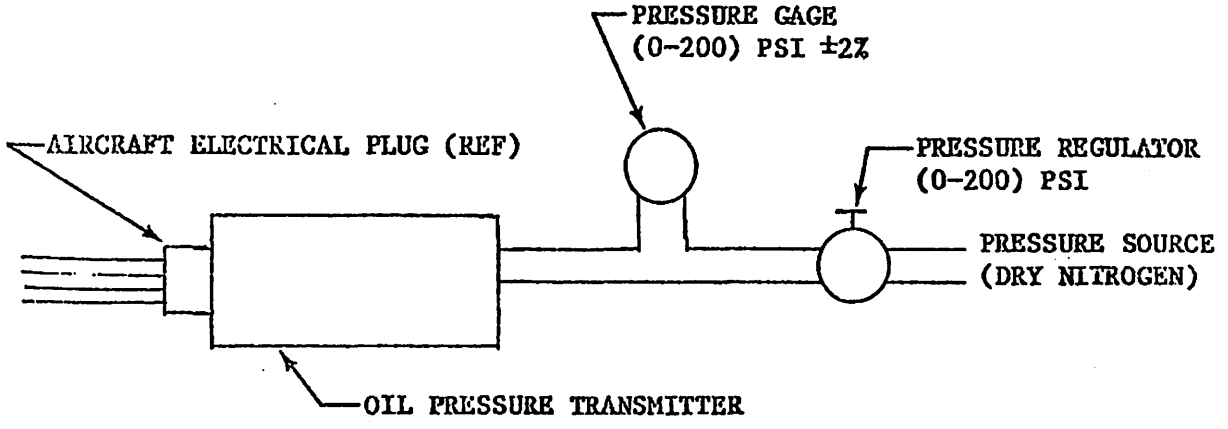
(1) Oil Pressure Transmitter Test

NOTE: The following test and adjustment procedures are performed with no pressure applied to transmitter.

(a) Connect external power to aircraft.
(b) Set Battery Switch and Inverter Switches on.
(c) Check applicable needle on oil pressure indicator for zero indication.
(d) If needle(s) are zeroed, return aircraft to service. If needle(s) do not zero, proceed with step (2)(a) thru (2)(c).

(2) Oil Pressure Transmitter Adjustment

(a) Remove nut, located adjacent to vent (V) and pressure (P) ports, from transmitter. DO NOT lose small o-ring.
(b) Using small wrench, turn eccentric clockwise or counter-clockwise to zero indicator.
(c) Install o-ring and nut on transmitter.

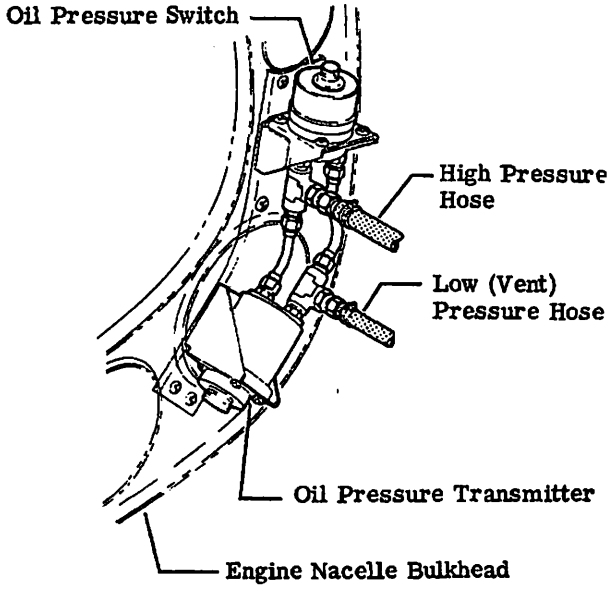


Functional Test Oil Pressure Transmitter
Figure 202

OIL PRESSURE SWITCH - MAINTENANCE PRACTICES

1. General
 A. An oil pressure switch is installed on each engine and senses the same oil pressure that is sensed by the oil pressure transmitter. Access to the oil pressure switch is gained by removing the lower engine nacelle covers. (Refer to 71-10-00)

2. Removal/Installation
 A. Remove Oil Pressure Switch (See figure 201)
 (1) Remove lower engine nacelle covers. (Refer to 71-10-00)
 (2) Disconnect electrical plug from pressure switch.
 (3) Disconnect tubing from switch. Cap pressure tube.
 (4) Remove attaching parts and pressure switch from engine.
 B. Install Oil Pressure Switch (See figure 201)
 (1) Install pressure switch and secure clamp.
 (2) Connect electrical plug to pressure switch.
 (3) Remove caps from tubing and connect tubing to pressure switch.
 (4) Install lower engine nacelle covers. (Refer to 71-10-00)



Oil Pressure Switch Installation
Figure 201

OIL TEMPERATURE INDICATOR - MAINTENANCE PRACTICES

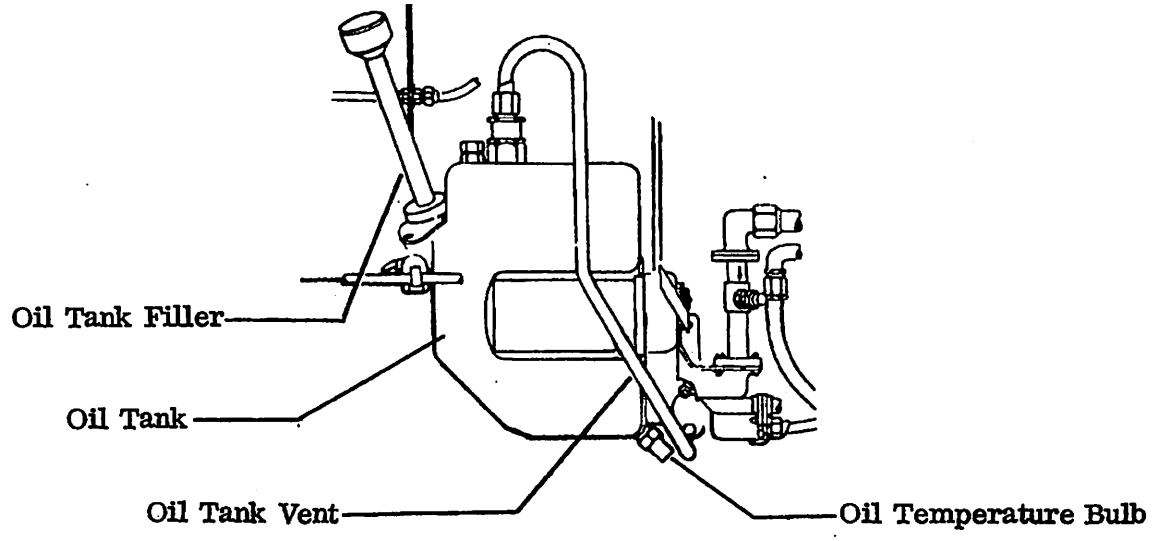
1. General
 A. The oil temperature indicators are located on the instrument panel.
 B. Maintenance practices consist of electrical wiring checks to and from the indicator and replacement of defective indicator.

2. Removal/Installation
 A. Remove Oil Temperature Indicator
 (1) Remove screws securing switch panel to instrument panel.
 (2) Remove switch panel sufficiently to allow removal of instrument cluster.
 (3) Disconnect electrical plug from instrument cluster.
 (4) Remove screw securing instrument cluster to switch panel and remove instrument cluster from aircraft.
 (5) Loosen screw in lower left corner of indicator and remove indicator from cluster.
 B. Install Oil Temperature Indicator
 (1) Install indicator in cluster and secure with screw.
 (2) Install instrument cluster and secure with attaching parts.
 (3) Connect electrical plug to instrument cluster.
 (4) Install and secure switch panel.

OIL TEMPERATURE BULB - MAINTENANCE PRACTICES

1. General
 A. An oil temperature bulb is installed on each engine. The temperature bulb senses the temperature of engine oil in the oil tank. Access to the temperature bulb is gained by removing the lower nacelle cover. (Refer to 71-10-00)

2. Removal/Installation
 A. Remove Oil Temperature Bulb (See figure 201)
 (1) Remove upper and lower nacelle covers. (Refer to 71-10-00)
 (2) Disconnect electrical plug from temperature bulb.
 (3) Loosen and remove temperature bulb and O-ring.
 B. Install Oil Temperature Bulb (See figure 201)
 (1) Install O-ring and temperature bulb.
 (2) Connect electrical plug to temperature bulb.
 (3) Install upper and lower nacelle covers. (Refer to 71-10-00)



LOOKING AT RIGHT SIDE OF ENGINE

Oil Temperature Bulb Installation
Figure 201